WHAT IS CLAIMED IS:

1. A magnetic recording medium, in which an aluminum oxide layer having holes on a substrate is filled with a magnetic substance, comprising:

at least one conductive layer between the aluminum oxide layer and the substrate,

wherein the conductive layer has fcc structure and its (111) face is oriented in a direction perpendicular to the substrate, and the magnetic substance includes a hard magnetic substance that has hcp structure and the c-axes of which are oriented in a direction perpendicular to the substrate.

2. The magnetic recording medium according to claim 1, wherein the hard magnetic substance includes Co.

3. The magnetic recording medium according to claim 1, wherein the aluminum oxide has nanoholes formed by anodic oxidization.

4. The magnetic recording medium according to claim 1, wherein the conductive layer is a base electrode layer.

5. The magnetic recording medium according to claim 1, wherein the conductive layer includes Cu as a

component.

6. The magnetic recording medium according to claim 1, wherein a portion of each of the fillers with which the holes are filled, the portion which contacts the conductive layer, has fcc structure and its (111) face is oriented in a direction perpendicular to the substrate.

7. The magnetic recording medium according to claim 6, wherein the portion touching the conductive layer includes Cu as a component.

8. The magnetic recording medium according to claim 6, wherein the portion touching the conductive layer includes NiFe as a component.

9. The magnetic recording medium according to claim 2, wherein the hard magnetic substance including Co includes at least one element among Cu, Cr, P, Ni, Pt, and Pd.

10. The magnetic recording medium according to claim 1, wherein materials from the conductive layer to the hard magnetic substance are given epitaxial growth.

11. The magnetic recording medium according to

claim 1, wherein a soft magnetic substance layer is formed under the conductive layer.

12. The magnetic recording medium according to claim 1, wherein the holes are arranged in a honeycomb array.

13. The magnetic recording medium according to claim 1, wherein the holes are arranged in a rectangular array.

14. A magnetic record and reproduction apparatus using the magnetic recording medium according to claim 1.

15. A magnetic recording medium, in which an aluminum oxide layer having holes on a substrate is filled with a magnetic substance, comprising:

at least one conductive layer between the aluminum oxide layer and the substrate,

wherein the conductive layer has fcc structure and its (001) face is oriented in a direction perpendicular to the substrate, and the magnetic substance includes a hard magnetic substance that has $L1_0$ structure and the c-axes of which are oriented in the direction perpendicular to the substrate.

16. The magnetic recording medium according to claim 15, wherein the hard magnetic substance includes MPt (M = Co, Fe, Ni).

17. The magnetic recording medium according to claim 15, wherein the conductive layer includes any one among Pt, Pd, Cu, Ir, and Rh.

18. The magnetic recording medium according to claim 15, wherein a portion of each of the fillers with which the holes are filled, the portion which contacts the conductive layer, has fcc structure and its (001) face is oriented in a direction perpendicular to the substrate.

19. The magnetic recording medium according to claim 18, wherein the portion contacting the conductive layer includes any one among Pt, Pd, Cu, Ir, and Rh.

20. The magnetic recording medium according to claim 16, wherein the hard magnetic substance including MPt (M = Co, Fe, Ni) includes at least one element among Cu, Cr, P, Ag, and Pd.

21. The magnetic recording medium according to claim 16, wherein materials from the conductive layer to the hard magnetic substance including MPt (M = Co,

Fe, Ni) are given epitaxial growth.

22. The magnetic recording medium according to claim 15, wherein an MgO (001) layer is formed under the conductive layer.

23. The magnetic recording medium according to claim 15, wherein a soft magnetic substance layer is formed under the conductive layer.

24. The magnetic recording medium according to claim 15, wherein the holes are arranged in a honeycomb array.

25. The magnetic recording medium according to claim 15, wherein the holes are arranged in a rectangular array.

26. A magnetic record and reproduction apparatus using the magnetic recording medium according to claim 15.

27. A magnetic recording medium, in which an aluminum oxide layer having holes on a substrate is filled with a magnetic substance, comprising:

at least one conductive layer between the aluminum oxide layer and the substrate, wherein the conductive layer has any one of $L1_0$, $L1_1$, and $L1_2$ ordered

structures, and its square array face is oriented in a direction perpendicular to the substrate, and the magnetic substance includes a hard magnetic substance that has the $L1_0$ structure and the c-axes of which are oriented in the direction perpendicular to the substrate.

28. The magnetic recording medium according to claim 27, wherein the hard magnetic substance includes MPt (M = Co, Fe, Ni).

29. The magnetic recording medium according to claim 28, wherein the conductive layer has any one among $L1_0$ ordered structure including MPt (M = Co, Fe, Ni), $L1_1$ ordered structure including CuPt, and $L1_2$ ordered structure including $CoPt_3$.

30. The magnetic recording medium according to claim 28, wherein the hard magnetic substance including MPt (M = Co, Fe, Ni) includes at least one element among Cu, Cr, P, Ag, and Pd.

31. The magnetic recording medium according to claim 28, wherein materials from the conductive layer to the hard magnetic substance including MPt (M = Co, Fe, Ni) are given epitaxial growth.

32. The magnetic recording medium according to claim 27, wherein an MgO (001) layer is formed under the conductive layer.

33. The magnetic recording medium according to claim 27, wherein a soft magnetic substance layer is formed under the conductive layer.

34. The magnetic recording medium according to claim 27, wherein the holes are arranged in a honeycomb array.

35. The magnetic recording medium according to claim 27, wherein the holes are arranged in a rectangular array.

36. A magnetic record and reproduction apparatus using the magnetic recording medium according to claim 27.

37. A method of manufacturing a magnetic recording medium that has a film with anodic oxidized alumina nanoholes filled with a magnetic substance, comprising:

a step of preparing a substrate;

a step of forming a conductive layer, which has fcc structure and its (111) face is oriented in a

direction perpendicular to the substrate, on the substrate, and forming an aluminum layer thereon;

a step of anodizing the aluminum layer and forming alumina nanoholes; and

a step of electrodepositing a hard magnetic substance layer, which has hcp structure containing Co in the alumina nanoholes while the c-axes are oriented in a direction perpendicular to the substrate, in the alumina nanoholes.

38. The method of manufacturing a magnetic recording medium according to claim 37, further comprising a step of electrodepositing a nonmagnetic layer, which has fcc structure including Cu and whose (111) face is oriented in a direction perpendicular to the substrate, before the step of electrodepositing the hard magnetic substance layer.

39. The method of manufacturing a magnetic recording medium according to claim 37, further comprising a step of electrodepositing a soft magnetic layer, which has fcc structure mainly including NiFe and whose (111) face is oriented in a direction perpendicular to the substrate, before the step of electrodepositing the hard magnetic substance layer.

40. A method of manufacturing a magnetic

recording medium that has a film with anodic oxidized alumina nanoholes filled with a magnetic substance, comprising:

a step of preparing a substrate;

a step of forming a conductive layer, which has fcc structure and whose (001) face is oriented in a direction perpendicular to the substrate, and an aluminum layer on the substrate;

a step of forming alumina nanoholes by anodizing the aluminum layer;

a step of electrodepositing a layer including MPt (M = Co, Fe, Ni) in each of the alumina nanoholes; and

a step of formation of hard magnetic substance oriented the c-axes in a direction perpendicular to the substrate in Ll_0 ordered structure by annealing process.

41. A method of manufacturing a magnetic recording medium that has a film with anodic oxidized alumina nanoholes filled with a magnetic substance, comprising:

a step of preparing a substrate;

a step of forming a conductive layer, which has any one of Ll_0, Ll_1, and Ll_2 ordered structure, and a square lattice face of which is oriented in a direction perpendicular to the substrate, and an aluminum layer on the substrate;

a step of anodizing the aluminum layer and forming

alumina nanoholes;

a step of electrodepositing a layer including MPt (M = Co, Fe, Ni) in each of the alumina nanoholes; and

a step of formation of hard magnetic substance oriented the c-axes in a direction perpendicular to the substrate in $L1_0$ ordered structure by annealing process.

42. The method of manufacturing a magnetic recording medium according to claim 40, further comprising a step of electrodepositing a nonmagnetic layer, which has fcc structure including any one among Pt, Pd, Cu, Ir, and Rh, and whose (001) face is oriented in a direction perpendicular to the substrate, before the step of electrodepositing the layer including MPt (M = Co, Fe, Ni) in each of the alumina nanoholes.

43. The method of manufacturing a magnetic recording medium according to claim 41, further comprising a step of electrodepositing a soft magnetic layer, which has fcc structure mainly including NiFe and whose (001) face is oriented in a direction perpendicular to the substrate, before the step of electrodepositing the layer including MPt (M = Co, Fe, Ni) in each of the alumina nanoholes.